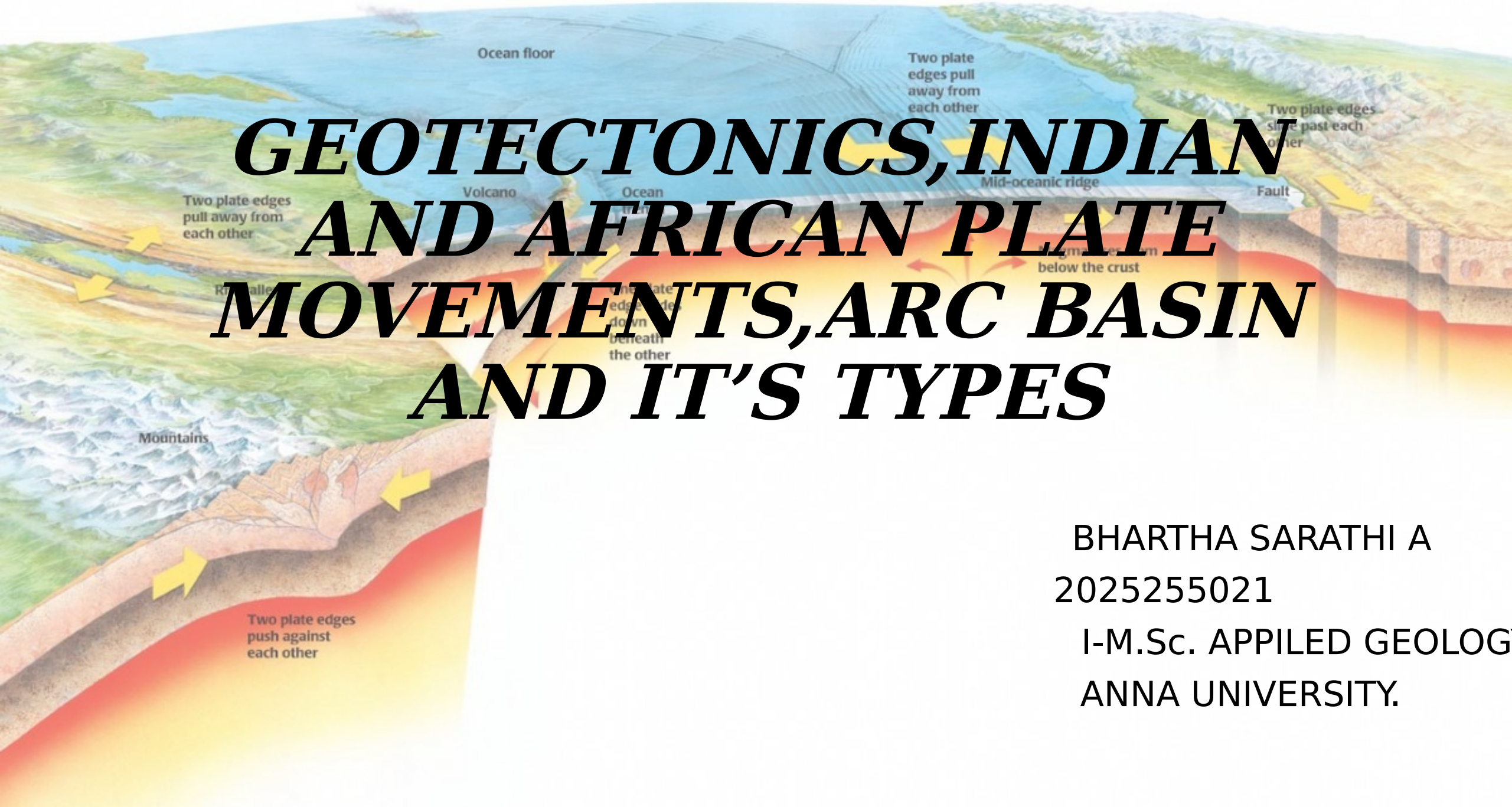

GEOTECTONICS,INDIAN AND AFRICAN PLATE MOVEMENTS,ARC BASIN AND IT'S TYPES

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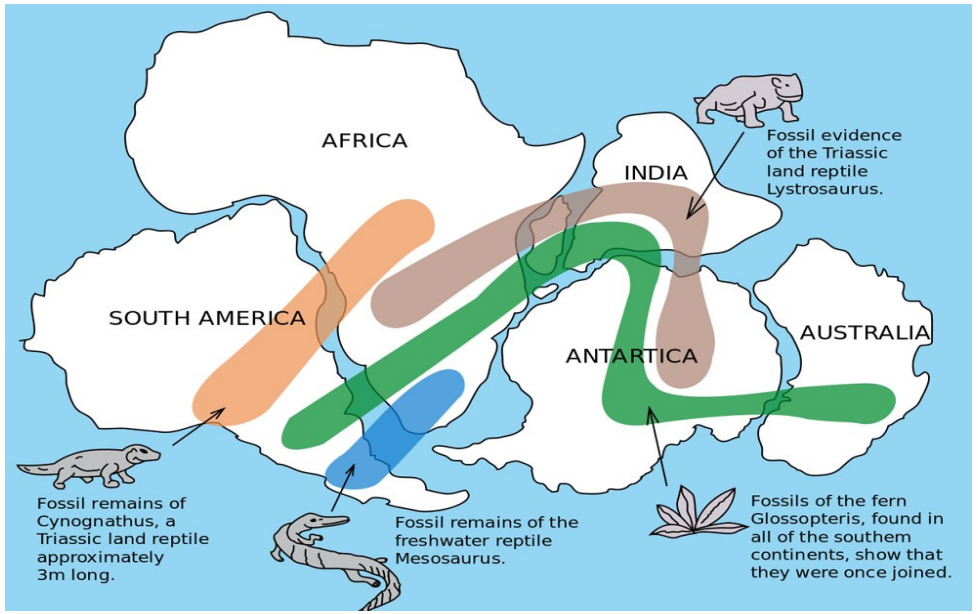
GEOTECTONICS

- **Geotectonics :** Relating to the form, arrangement, and structure of rock masses of the earth crust resulting from folding or faulting.

- The word Geotectonics is derived from two Greek words geo-**earth**, and tectonic-**to build**. It consequently means literally the science of the Earth's structure, but such a definition is too wide since it embraces, in essence, almost, the whole of geology. Tectonics (from the Late Latin tectonicus from the Greek τεκτονικός**, pertaining to building** is concerned with the processes which control the structure and properties of the Earth's crust, and its evolution through time.

CONTINENTAL DRIFT THEORY

- The **Continental Drift Theory**, proposed by German meteorologist Alfred Wegener in 1912, suggests that Earth's continents were once joined in a single supercontinent called **Pangaea** and have since drifted to their current positions over millions of years.
- **Pangaea:** It was a massive supercontinent that incorporated almost all Earth's landmass. **Panthalassa** was single, enormous superocean that surrounded.


AFRICA
INDIA
SOUTH AMERICA
ANTARTICA
AUSTRALIA
Fossil evidence of the Triassic land reptile Lystrosaurus.
Fossil remains of Cynognathus, a Triassic land reptile approximately 3m long.
Fossil remains of the freshwater reptile Mesosaurus.
Fossils of the fern Glossopteris, found in all of the southem continents, show that they were once joined.

- In 1596, Abraham Ortelius suggested that continents were once joined and later separated.
- In 1620, Francis Bacon also noticed similarities in the shapes of continents.
- World war II **Drift an the non Drift Theroy**

EVIDENCES :

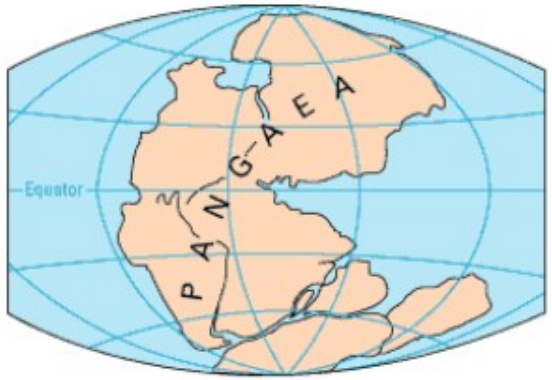
- **Jigsaw Fit of Continents**: The coastlines of separate continents appear to fit together. Most notably, the bulge of eastern South America fits into the bight of Western Africa.
- **Fossil Correlations**: Identical fossils of species that could not cross vast oceans have been found on far-flung continents.
  - **Mesosaurus**

    A freshwater reptile found only in eastern South America and South Africa.

    Glossopteris

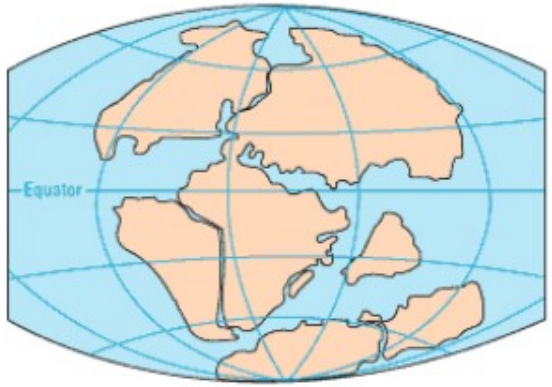
    An ancient seed fern found across South America, Africa, India, Antarctica, and Australia.
- **Mountain Ranges**: The Appalachian Mountains of North America are geologically identical to the Caledonian Mountains in Scotland and Scandinavia.

- **Glacial Evidence**: Grooves (striations) and deposits (tillite) from ancient glaciers are found in tropical areas like India and Africa, suggesting they were once near the South Pole.

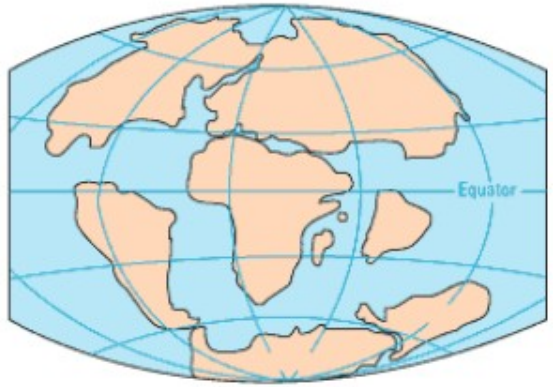


PERMIAN
225 million years ago

TRIASSIC
200 million years ago

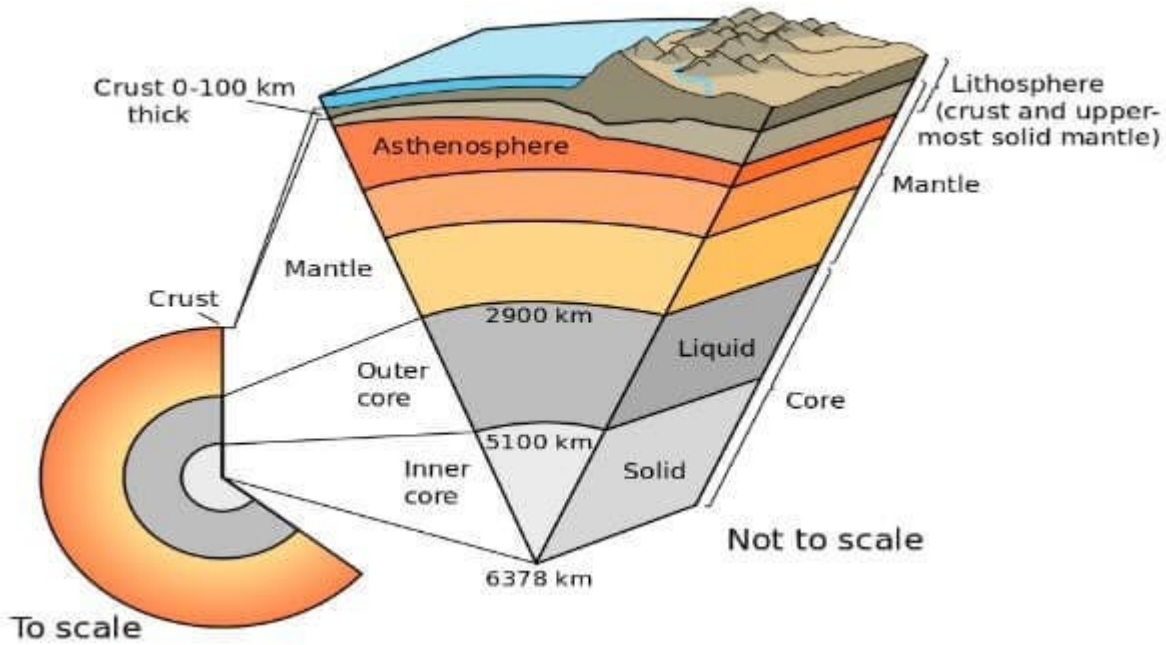


JURASSIC
135 million years ago



CRETACEOUS
65 million years ago

PRESENT DAY



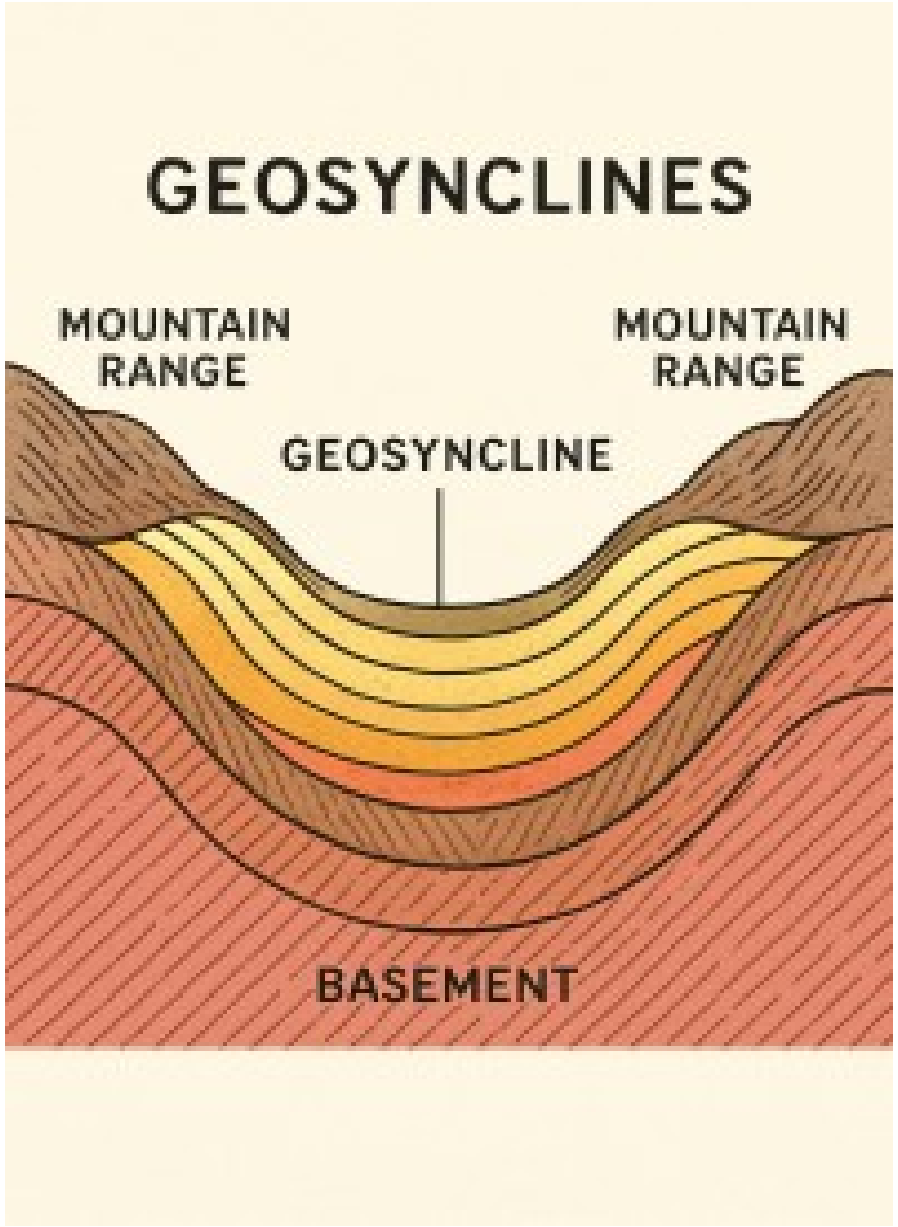
SEAFLOOR SPREADING

This concept was proposed in 1962 by **Harry Hammond Hess**

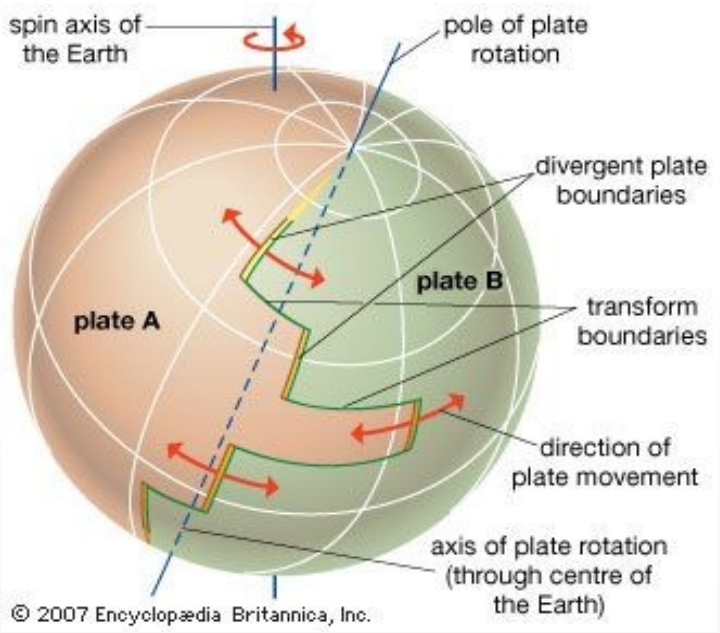
Seafloor Spreading is the geological process in which new oceanic crust is created at **Mid-Ocean Ridges** and moves outward on both sides.

According to this theory, magma from the Earth's mantle rises through cracks along the mid-ocean ridges. When the magma reaches the ocean floor, it cools and solidifies to form new **Oceanic Crust**. As more magma rises, the newly formed crust pushes the older crust away from the ridge. This continuous formation and outward movement of crust causes the ocean floor to spread.

Over millions of years, the spreading process moves tectonic plates apart and may eventually lead to the formation of new ocean basins. In some areas, the older oceanic crust is destroyed at **Subduction** zones, where one plate sinks beneath another into the mantle.


GEOSYNCLINES
MOUNTAIN RANGE
MOUNTAIN RANGE
GEOSYNCLINE
BASEMENT

EULER'S THEOREM


spin axis of the Earth
pole of plate rotation
divergent plate boundaries
plate B
plate A
transform boundaries
direction of plate movement
axis of plate rotation (through centre of the Earth)
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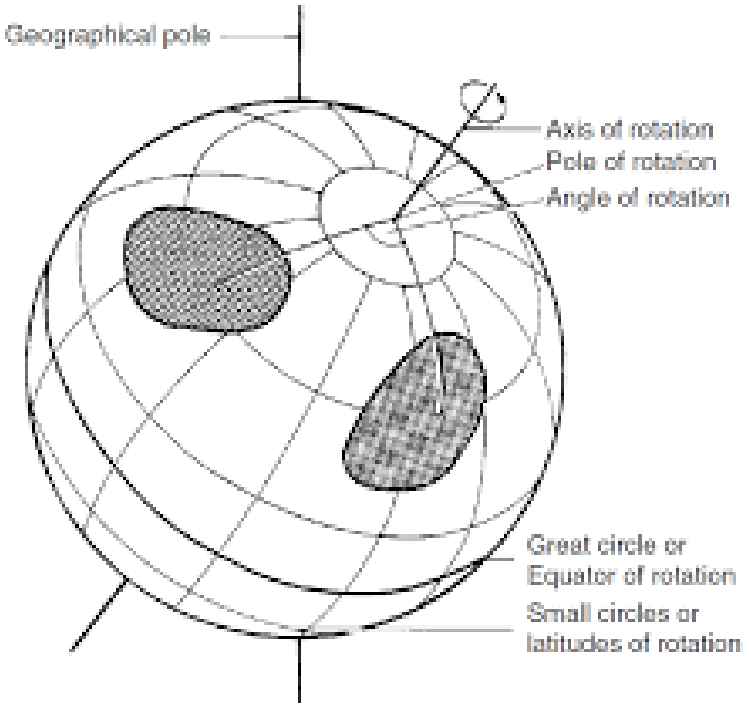
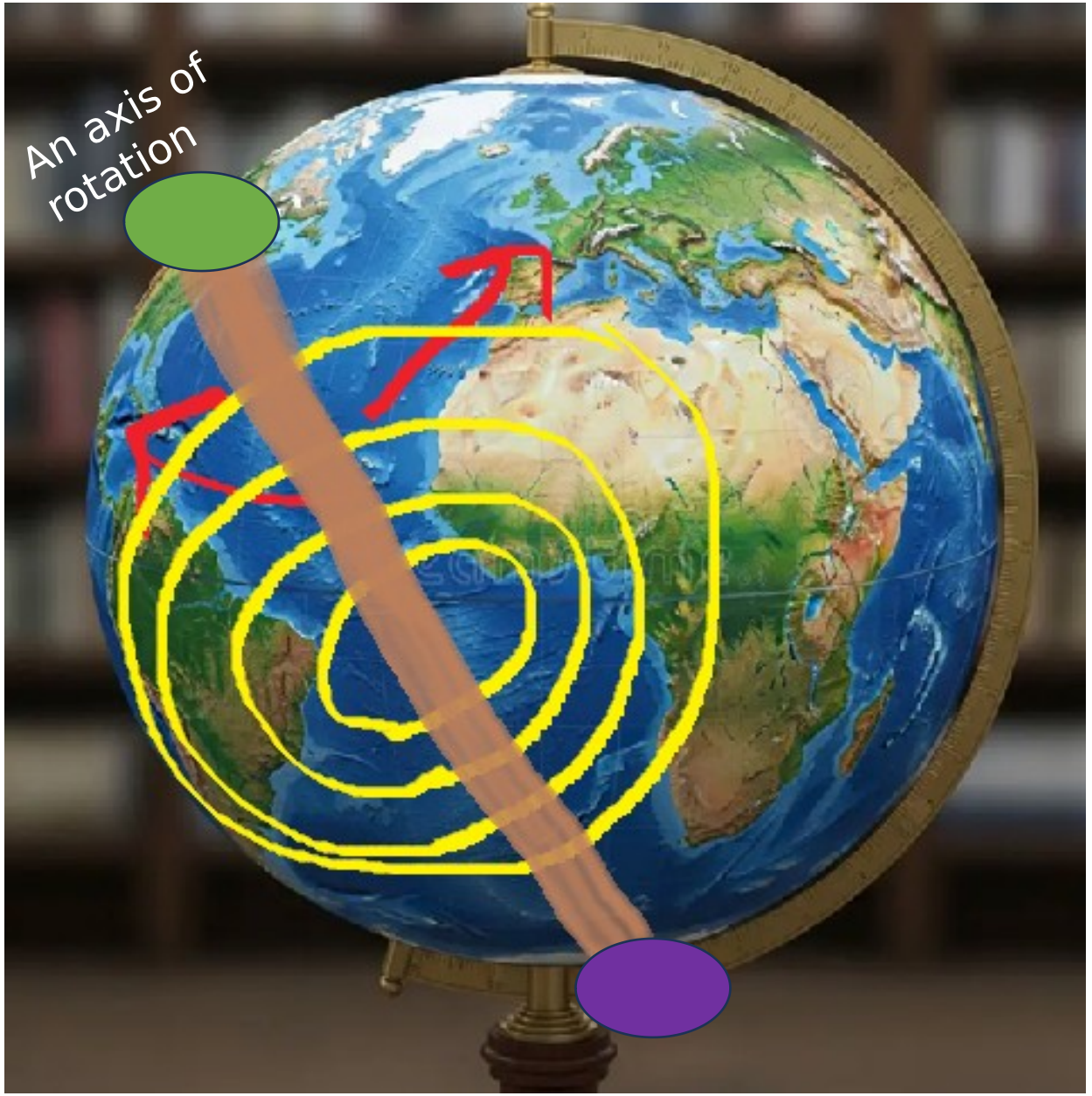
Euler's theorem establishes a powerful mathematical principle any movement of a rigid body across the surface of a sphere can be uniquely defined by a single angular rotation about a specific axis p e sphere's center.




An axis of
rotation

Rotation pole:

The point on the sphere's surface where the rotation axis intersects, remaining fixed during the entire movement of the continental fragment.

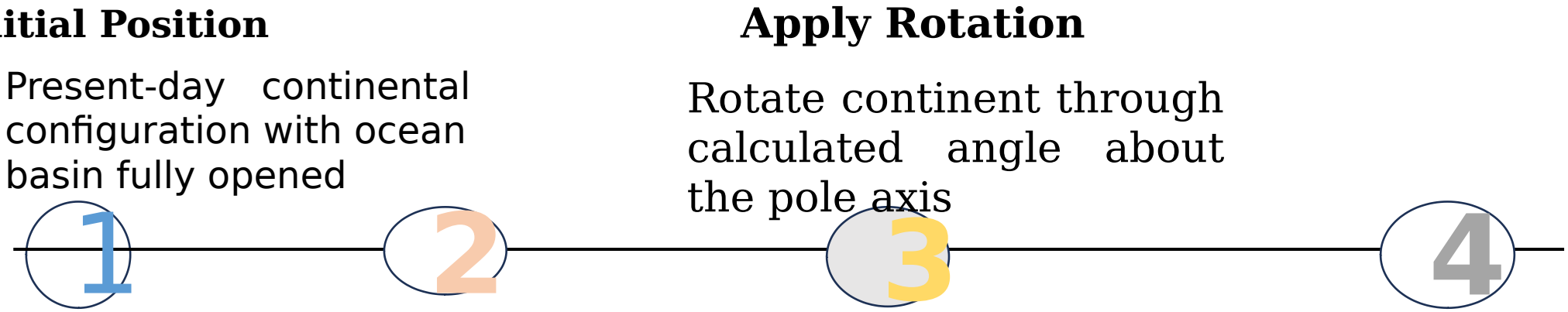
Antipodal Point

Located on the opposite diameter of the sphere, this point also remains stationary, forming the second fixed reference for the rotation axis.

Angular Rotation

The magnitude of rotation about the axis, measured in degrees, defining how far the continental mass has moved from its original position.

VISUALIZING EULER ROTATION:



KEY ADVANTAGES OF EULER FRAMEWORK:

Mathematical Rigor:

Provides precise, testable predictions for continental positions that can be validated against multiple independent datasets including paleomagnetic declinations, plate boundary orientations, and fracture zone trends.

Unique Solutions:

For any given continental fit, only one rotation pole and angle combination will produce that specific geometric configuration, eliminating ambiguity in reconstruction models.

Computational Efficiency:

Reduces complex three-dimensional movements to simple two-parameter calculations that can be rapidly computed and iteratively refined as new geological constraints become available.

Implications for Plate Tectonic Reconstructions:

Reconstruct Ancient Geography:

Precisely restore continents to pre-drift positions across closed ocean basins

Test Tectonic Hypotheses:

Quantitatively evaluate competing models of plate movements through geological time.

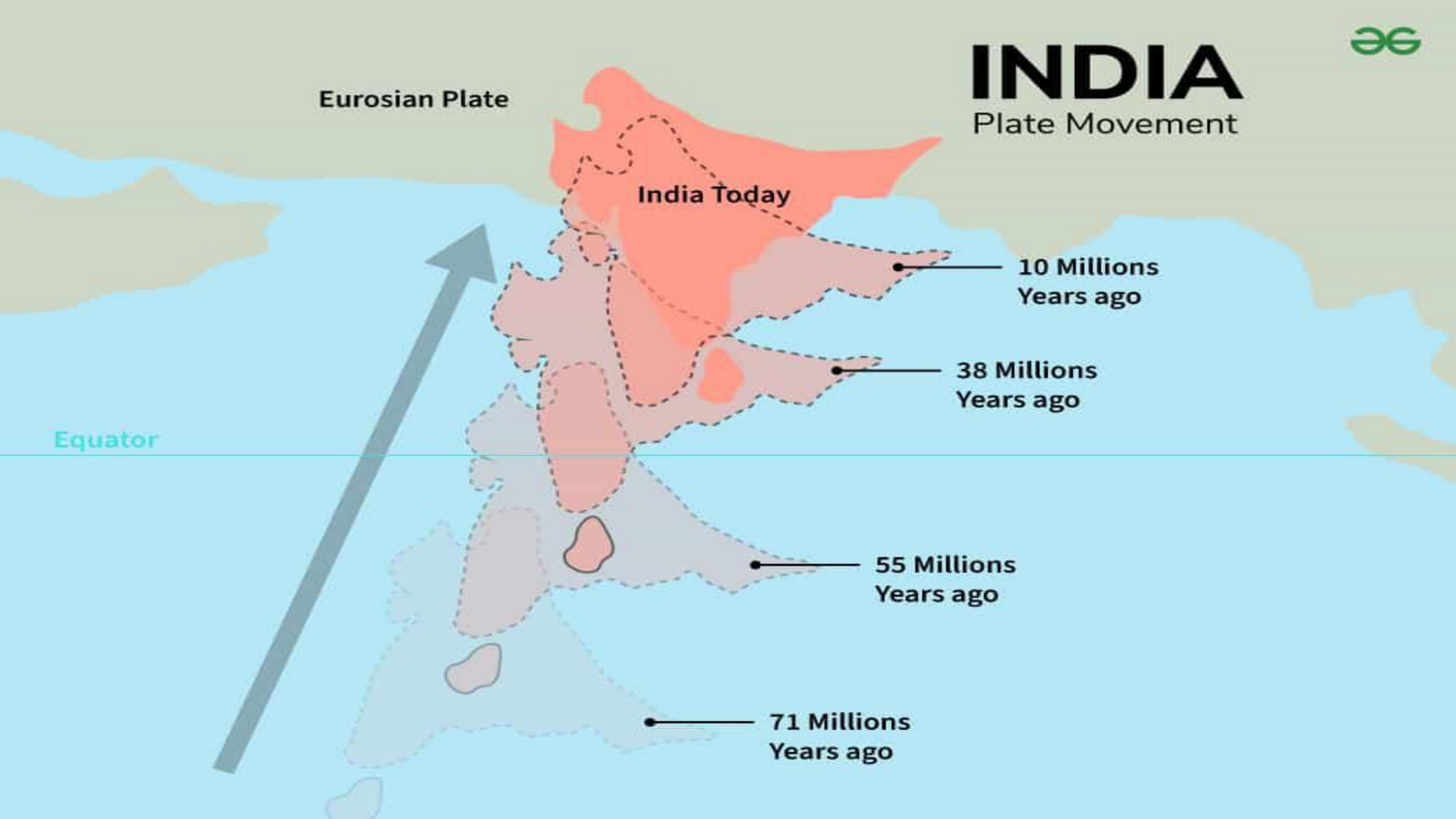
Integrate Multiple Data Types:

Combine geometric fits with paleomagnetic, geological, and geophysical constrat.

Predict Plate Boundaries

Calculate expected locations of ancient plate margins and transform faults.

INDIAN AND AFRICAN PLATE MOTIONS :


INDIA
Plate Movement
Eurosian Plate
India Today
10 Millions
Years ago
38 Millions
Years ago
Equator
55 Millions
Years ago
71 Millions
Years ago